Kunapipi

Volume 31 | Issue 2 Article 5

2009

Storymaking across contexts: How a fiction writer and a team of computer scientists came to terms

Beth Cardier

H.T. Goranson

Storymaking across contexts: How a fiction writer and a team of computer scientists came to terms

Abstract

In July 2001, a young Australian writer of fiction was asked to help envision the next generation of intelligent reasoning systems. She was an unlikely candidate. At the age of 27, she was preoccupied with storytelling, testing her acting abilities in semi-professional theatre and toying with plots for a science fiction novel. In search of ideas for future inventions, she attended a conference on ‘Symmetry: Art and Science’, planning to audit the event for a day. She didn’t realise that a wellfunded systems architect was scouting the forum, looking for novel approaches to a longstanding problem in computer science.

BETH CARDIER AND H.T. GORANSON

Storymaking across Contexts: How a Fiction Writer and a Team of Computer Scientists Came to Terms

In July 2001, a young Australian writer of fiction was asked to help envision the next generation of intelligent reasoning systems. She was an unlikely candidate. At the age of 27, she was preoccupied with storytelling, testing her acting abilities in semi-professional theatre and toying with plots for a science fiction novel. In search of ideas for future inventions, she attended a conference on 'Symmetry: Art and Science', planning to audit the event for a day. She didn't realise that a well-funded systems architect was scouting the forum, looking for novel approaches to a longstanding problem in computer science.

As the writer listened to the presentations, she saw the problematic relationship between art and science for the first time (Snow 1993). She experienced a 'postcolonial moment' in which 'disparate knowledge traditions abut and abrade … stuck fast, in power relations characteristic of colonizing' (Verran 730). The scientists displayed artworks and explained how they were measuring them — Kandinsky, Picasso and Escher were reduced to lines over grids. Used to trusting their truths, these researchers had not questioned whether their formalisms could report meaningfully on a different field. When it was time for the artistic delegates to speak, they did not engage with such metrics. Instead they spoke in poetic manifestos, many of which just affirmed the 'non-narrativisable' nature of their practice (Spivak 1990 144).

The young fiction writer's understanding of stories was different from either of these. Without a paper submission, she asked the organisers whether she could present. Before the delegates returned to their home countries, she explained how her story-making tools depended on a structure beneath the semantics (Cardier 2004).

As a result, the writer was invited to participate in a collaborative science project. She was chosen because her ideas were different from conventional approaches, but this also increased the challenge of saying anything comprehensible to her team. Colonial dynamics can exist between fields of research, and it is common for both the creative arts and science to treat each other as exotic spaces of fieldwork (Law 98), with one of the many consequences being displaced or repressed knowledges (Law 148). Given the divergent notions of text, proof and truth within the new interdisciplinary group, on whose terms should they speak? If the computer scientists adopted the writer's terms, their work could not be implemented in a machine. If the writer tried to express her ideas in relation to existing theories of information science, the work would not capture the extra insights needed. Before the group could collaborate, their disciplinary cultures had to negotiate shared territory (Devlin 5). Valuable ideas were hovering between the specialists in a space they could not see.

* * * * *

The aim of the project, named *Sheherazade*, was to design foundations for a new sort of knowledge base. A knowledge base is similar to a database except it stores concepts so they can be assembled and enriched by reasoning systems. For the non-expert, imagine that instead of a computer providing a user with canned responses, it gathers clouds of media fragments into tailored answers. A database just returns what was put in; a knowledge system extends what has been stored.

The usefulness of a system's output is limited by its knowledge terms. Think of the terms as the knowledge-about-the-knowledge inside the computer. Knowledge-about-knowledge is similar to John Law's notions about creating models of reality, in which 'it becomes important to think through modes of crafting that let us apprehend' (Law 152). In a knowledge base, this manifests as a higher level of operation within the system, a knowledge base in itself. The abilities of current systems suggest that if strong computerised reasoning is desired, this higher-level system has to be large and complex, perhaps as large as the knowledge base itself. The *Sheherazade* project addressed this fundamental level, wanting to figure out a better way to model the apprehensions on which the system's terms would rest.

The cost of neglecting this knowledge-about-knowledge can be illustrated by describing what is still not possible for knowledge bases. Cancer research is an interdisciplinary affair, performed by teams. Each participant is an expert in a unique area, so specialised that the others generally do not understand the details in depth. These collaborative researchers will puzzle, query, and explain to each other, and perhaps not make much progress. Mathematics helps, but only a bit. A key problem is context: each specialist uses the context of a particular discipline to situate the meaning of her or his statements, but colleagues do not have access to the same reference points. A new sort of knowledge base could solve a significant portion of the communication problem, so that every piece of information under discussion could be transferred into multiple terms. New connections and insights could emerge. State of the art knowledge representation schemes, like those used by the US intelligence community and the semantic web, currently cannot automatically and accurately transfer information between numerous contexts in this way.

Humans intuitively understand context (Ikris 6). Without consciously thinking about it, people understand that when the context changes, the meaning of statements within it also alters. Here is a simple example — a story told by a two-year-old child:

> The baby cried. The mommy picked it up. (Devlin 81)

This tale can be understood to represent comforted distress. Consider how the perceived context changes if I add another sentence:

> The baby cried. The mommy picked it up. The mommy hit the baby again.

Now the situation could be one of child abuse. In the world as it is experienced there is always another piece of information coming, and 'there is never closure' (Law 132). Humans are able to re-evaluate their assumptions about a situation if new, conflicting information is received. The *Sheherazade* project wanted to discover what sorts of representations would enable a knowledge system to automatically re-contextualize knowledge, in such a way that new causal connections between elements might emerge.

We started with the idea that computer systems could manage contexts in the same manner as stories. Even though a story refers to known imagery and ideas, it can synthesise these from many different contexts, and in the process alter them to produce new, unexpected arrangements. The *Sheherazade* team's resident writer began research into a particular aspect of stories: how humans can maintain an evolving understanding of information, even when its contexts are changing or disjunctive.

* * * * *

Actually that is not true. At first the writer did not even understand the problem. Why not just program the computer to add new information to the old? she asked. The scientists explained that computers could not cope with information that was 'unexpected'. This is because there is a map inside all systems, known as an ontology.

In computer science, an ontology is a fixed constellation of concepts that defines the terms used by the system, like a dictionary. The term ontology originally came from philosophy — there it refers to the nameable aspects of reality (Hofweber online). In this respect, the computer science notion of ontology is similar to that of Law, who sees an ontology as a way in which 'particular realities are brought into being' (132). The computer science definition differs, however, in the specific terms of that representation:

> I define ontology as a set of knowledge terms, including the vocabulary, the semantic interconnections, and some simple rules of inference and logic for some particular topic. (Hendler 30)

Figure 1 is an example of part of a representation for a low-level ontology developed for a website that helps travellers find preferred airline seats. The method of ontological representation informs the reality modelled, both capturing and producing a situation of conceptual objects and relational links.

Ontological terms are necessarily finite in computer science, so concepts do get left out. This causes problems for systems and the users who depend on them. If an unexpected question is asked of an airline database, such as 'send Munich to Frankfurt' (where 'Munich' is the soccer team), and the system does

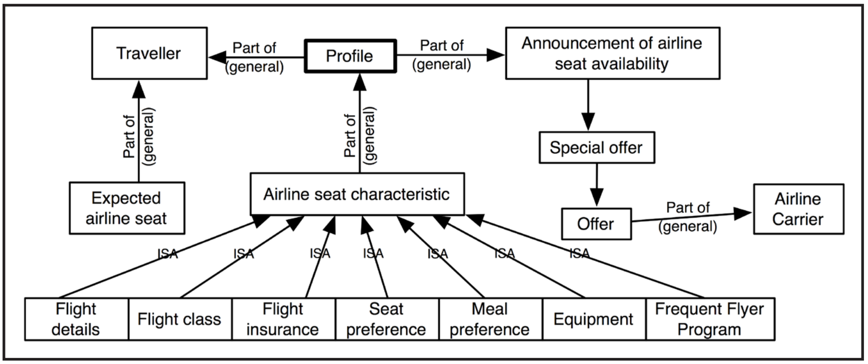

Fig. 1. Part of an ontology for choosing airline seats (Kanellopoulos 203).

not understand, strange transits could result. The problem gets worse when two different ontologies try to interact. A simple example: consider the way an airfare database depends on a relationship between departures, destinations, and prices (Kanellopoulos 199). If it tries to interact with a system that deals in plane crashes, the concepts surrounding 'plane seat' will likely be different. If one system understands but the other does not — or worse, thinks it does but does not, they will likely malfunction. Because each represents a different abstraction of reality, the relations between concepts differ, even if some of the actual terms are the same.

Current ontologies cannot change much once they are implemented in a computer, unlike a human who can learn new ways of thinking. As a consequence, a knowledge system can only process information if it slides easily into the available abstractions. Anything else is 'unexpected' and so cannot be handled. Ontological conflict, if managed poorly, diminishes the concepts available for enactment:

> … if the lines of making sense of something are laid down in a certain way, then you are able to do only those things with that something which are possible within and by the arrangement of those lines. (Spivak 1993 34)

Inadequate context modelling has two implications for the knowledge base that tries to analyse cancer. First, it cannot synthesise data from many different sources. Second, even if it could, neither it, nor any application, could propose new, unexpected therapies. We wanted to make a system that could redraw the lines over and over. How could we endow our knowledge-about-knowledge with an understanding of contextual re-interpretation?

* * * * *

Non-Ideal Solutions

Researchers have been trying to formalise contextual re-interpretation since computers were invented, and have still only partly succeeded. One approach is to institute a common ontological standard and establish it as universal, applying both to context and facts. Apart from whether this is do-able, this assumes one context. In this homogenisation, every system uses the same, agreed-upon terminology and logic. For example, the Semantic Web has a common ontology, based on OWL, the Web Ontology Language. Supporters suppose it could eventually embrace all the expertise covered on the web, making more accurate searching possible. The problem is that specialised information is so peculiar to a domain that the required ontology explodes in size. As a consequence of the expected failure of this approach, senior researchers in the field have started work on ever higher and higher meta-ontologies, with the case against the OWL approach even being made by one of its originators (Ikris 6), (Cheikes 3).

Another solution has been to develop a bridging mechanism, such as an intermediary lexicon, that each context's ontology can use to map and share concepts (Park and Ram 598). This assumes that beneath the differing abstractions is a standard reality — a single abstraction against which any ontology could be matched and 'translated'. The first problem is that this designates one particular abstraction as the common standard; another is the assumption that this abstraction can be a suitable bridge between any two contexts. Consider what sort of middle space lies between the notions physical trauma and psychological trauma, compared with the connection between physical trauma and news photography. For an accurate transference of ideas, the middle ground depends on the specifics of each case.

Other research, notably the 25-year *Cyc* project (Kanellopoulos 196), assumes that a 'federated' approach is required — 'federation' being a combination of multiple integrated ontologies. These ontological citizens are united using a single, coherent framework, a meta-ontology. Unfortunately, both the *Cyc* and Semantic Web approaches seem to be running into unbreachable barriers (Copeland 1). The problem is simply that the rules behind the ontology that were designed to simplify things, become too complex to code.

The assumption underlying all approaches is that one framework can produce ontologies that can adequately capture anything in the universe, as well as being usable by every feasible application. Yet, experience with working computer systems indicates the opposite — that ontologies are the most supportive when they are purpose built for a single domain. The limit is not the knowledge per se, but the idea that there is a single knowledge-about-knowledge.

The *Sheherazade* group started by assuming that a context was more than a subsection of a single ontology. Instead it is an enactment — a particular view, a moment and mode of representation. Shifting between contexts not only means a shift in what constitutes fact, but the way in which such assemblages cohere — the terms of their terms. The domain of storytelling could offer this structure, if only our research group knew how to characterise it. A story can contain numerous perspectives, and even tales that share similar plot elements can convey different meanings. An old story can be constantly remade, 'clotting' in new ways (Law

138). To this behaviour, we added another consideration. We assumed that part of our understanding of context depends on the fact that we know it can change (Goranson and Cardier 2007). Important, previously unrepresented mechanisms existed in the transition from one view to another. We needed to understand the behind-the-scenes construction of stories, the activity of the storyteller.

It soon became clear that our group was dealing with two instances of the same dynamic. The first would become the basis of a new approach to ontological representation. The second was the interaction between members of our team. As Law says, reflexivity about the contexts from which ideas are built is critical, because 'methods enact divisions' (Law 153). As our collaboration progressed, we drew increasingly from the ways in which we were coping with our own disjunctive contexts. We could not rely on a generic middle ground, because given the range of disciplines, there was none. We could not invent a general standard reality and ask all members to conform to it, because everyone's context-specific knowledge would be lost. The strengths of the system would depend on our ability to reason about how we were trying to reason, and transform our knowledge into a new conceptual space.

* * * * *

It started with the systems architect patiently teaching the writer about computer systems. He made it clear that the writer had been brought into the project because current scientific approaches could not do what he needed, thus it would be a disaster if, in the process of learning computer science, her writerly intuitions were trampled. To avoid this, the writer was taught scientific modelling techniques as an extension of the research for her science fiction novel. Years passed before it seemed as though she was discussing anything remotely connected to computers.

The second risk concerned analogy. Any writerly principle could be arbitrarily correlated to any aspect of systems architecture, because there was no ideal, objectively correct relationship between creative writing and knowledge bases. But it was still tempting to use the connections made by previous theorists, in relation to unrelated projects. It emerged that the only reliable parameter that could inform the linking of our contexts was the focus of application — in this case, a context-sensitive reasoning system. Our specific, intended product would gradually define the relations between our members' expertise.

After a year, the writer realised that the area of computer science closest to her concerns was knowledge representation. As she moved into this domain, her soft intuitions were besieged from a new direction. When she mingled with computer scientists, she encountered veterans, who were curious and asked her to get back to them when she could demonstrate ideas in math, and she met rising stars, who pointed out that her ideas did not belong. Principles that she had assumed to be natural prickled with tension in their new surroundings. Sometimes she wondered wonder whether they existed at all.

By 2007, the writer understood enough about her relationship to computer science to work with the rest of the team. She was flown to Boston, to spend a month with graduates from the Massachusetts Institute of Technology, who were hired to build the system. Even though she had been auditing programming and logic classes for a year, she was afraid she had not yet learned enough to communicate with this savvy crew. She did not know that her deficiencies of language would not negatively affect the workshop. The whole team was about to learn the importance of drawing on multiple contexts, in order to build a shared mode of storytelling.

* * * * *

Cohering Fragments

A storyteller begins by drawing together elements from a range of contexts. These fragments exist at both the syntactic level of words and phrases, as well as the conceptual level of images, themes and other already-established stories. As the tale unfolds, a reader gradually learns how the incongruent pieces are likely to be associated, how their relations are changing, and the terms on which change can occur. Curiously, such formation is possible even when those associations are unexpected, or their inferred contextual meanings conflict. Far from crashing into incoherence, as would occur in a knowledge base that encountered the same sort of discontinuity, the parts of the story that do not yet cohere can actually drive a reader to consume more text, in the hope of discovering how the rogue pieces fit. Once made, the story can be re-imagined, re-told or dismembered, so its parts can be digested by new stories.

We needed to develop a context in which our research could occur. Here, core principles from each of our fields would have meaning, although perhaps not their usual meanings. The writer taught the group how stories were driven by ambiguity and missing information; the computer scientists explained that mathematics and logic work because they do not. We wondered how we would ever get along. The writer needed to reach into another context, in order to flesh the shape of her ideas. She needed an example.

She chose the fairytale *Red Riding Hood*. Theorist Sandra Beckett believes this is 'the most commented on fairy tale of all time' (xv) and narratologists have tracked the elements that most frequently re-occur (Orenstein 231). As a result of the commonalities of plot and character in multiple versions of this tale, narrative analysts sometimes share the attitude of Catherine Orenstein, who asserts that 'like a change of wardrobe, motifs come and go without altering the body of tales' (231). This is certainly one way to look at it. But in terms of our problem, this narratological stance was similar to the assumption of the fixed ontology used in computer science. It posited that it was possible for features to retain standard meanings, no matter what context they appeared within.

The writer presented two versions of *Red Riding Hood* to the group. She wanted to show how the process of storytelling could alter the meaning of particular features in different versions of the story — girl, wolf, grandmother, being eaten — even though the characters and plot remained the same. She believed each story enacted a unique ontology, simply by being told.

* * * * *

Cause of Death

In order to establish a fixed point of reference, the writer focused on the same concept in each *Red Riding Hood* example — death. This made it easier to show that an identical concept in two stories could be used to convey different meanings. She was particularly keen to show how the writers had constructed specific conceptual spaces in order to produce those meanings. In each story, the reasons for a character's death were identified through the way its ontological reality had been revealed.

The first story was Walter De la Mare's *Little Red Riding Hood*, which was written in 1927, towards the end of the economic boom known as the Roaring Twenties (Osgerby 80). The defining characteristic of his child heroine is her vanity. Vanity is established as significant from the outset, being responsible for the most familiar aspect of the protagonist's identity, her hood:

> In the old days when countrywomen wore riding-hoods to keep themselves warm and dry as they rode to market, there was a child living in a little village near the Low Forest who was very vain. She was so vain she couldn't even pass a puddle without peeping down into it at her apple cheeks and yellow hair… Nothing pleased her better than fine clothes, and when she was seven, having seen a strange woman riding by on horseback, she suddenly had a violent longing for such a riding-hood as hers, and that was of scarlet cloth with strings. (de la Mare 208)

This is the first information encountered by the reader. As such, vanity becomes a term of meaning, informing the reader's first view of the heroine's activities, attitudes and even the object associated with her name.

As the story progresses, the reader learns that vanity is not the girl's only vice. As she wanders through the forest, her mother's sober warnings compete with 'greedy thoughts of what she would have to eat at the end of her journey' (de la Mare 209). Vanity is a foundational concept, but with this inclusion of gluttony, the terms are expanded to include both — vice. Forgetting her mother's warning 'not to lag or loiter in the Low Forest' (de la Mare 209), Red Riding Hood falls lazily asleep, thus adding *sloth* to her list of vices. Having confirmed that vice is a concept with agency, the story then progresses through consequences on these terms. When Red Riding Hood succumbs to sloth, her sleep creates a state of vulnerability:

> In her sleep she dreamed a voice was calling to her from very far away. It was a queer husky voice, and seemed to be coming from some dark dismal place where the speaker was hiding. At the sound of his voice calling and calling her ever more faintly, she suddenly awoke, and there, no more than a few yards away, stood a Wolf, and he was steadily looking at her. (de la Mare 211)

At this stage of the story, the wolf begins to represent a form of punishment, a consequence of virtue's lapse. In other versions of this fairytale, the wolf signifies other concepts — for example, in a medieval account of the myth, the wolf is believed to represent 'the violence of the infernal wolf, the Devil' (Ziolkowski 117). In another version by the Brothers Grimm, he is a 'seducer' (Bettelheim 172). In de la Mare's story, the wolf demonstrates that dealing in vice leaves one open to the vice of others.

Just as the girl is subject to these terms, however, so is the wolf. The terms of meaning are reinforced when the pattern repeats. The wolf indulges in gluttony, eating both grandma and the girl. As with Red Riding Hood, the wolf's own vice leaves him vulnerable to death:

> Nevertheless, that cunning greedy crafty old Wolf had not been cunning enough. He had bolted down such a meal that the old glutton at once went off to sleep on the bed … And he had forgotten to shut the door. (de la Mare 214)

Indulgence of vice again leads to a vulnerable sleep, and the hunter enters to slay the wolf. The role of the wolf now shifts from punisher to punished:

> 'Oho! You old ruffian,' [the woodman] cried softly, 'is it you?'
>
> At this far-away strange sound in his dreams, the Wolf opened — though by scarcely more than a hair's breadth — his dull, drowsy eyes. But at a glimpse of the woodman, his wits came instantly back to him, and he knew his danger. Too late!
>
> (de la Mare 214)

By the end of the story, its terms are settled. The ontological parameters are that vice leads to excess, which can cause an unknowing sleep, which in turn results in death. It is interesting to note that even though grandma is not portrayed as having vice, and is eaten, the terms of the story remain consistent. As the reader learns of her demise, they are simultaneously assured that grannie's 'death' is only temporary, with the parenthetical 'for a while': '[t]he door came open and in he went; and that (for a while) was the end of grannie' (de la Mare 191).

Sure enough, Grannie is later rescued, along with Red Riding Hood, who has now learned not to indulge in vice (de la Mare 193). Meaning is built by the ways concepts are associated with each other. These meanings are primed by the causal consequences established by the tales' unfolding, and the terms on which these events occur.

Compare the above ontological parameters to those of *Red Riding Hood as a Dictator Would Tell It*, by H.I. Philips. This version was written in 1940, in the United States, before the country entered the Second World War. In the title alone, two commonly known contexts are juxtaposed — generic images of Red Riding Hood and general notions of dictators. Such a deliberate initial assembly alerts the reader that juxtaposition might be a term of meaning. The first few sentences of the story build imagery to support this, with the wolf's sensitive qualities being so emphasised as to seem laboured:

> Once upon a time there was a poor, weak wolf. It was gentle and kindly and had a heart of gold. It loved everybody and felt very sad when it looked around and saw so much deceit, selfishness, strife, treachery and cunning on the loose. All it wanted was to be let alone. (Phillips 230)

Given the title's suggestion that this tale is an interpretation, the characterisation of the wolf as kind can be read from two different perspectives. If the narrator is telling the truth, the meaning of this story will be an inversion of the traditional *Red Riding Hood*, in which the wolf is usually devious. If the narrator is not telling the truth, the nature of the situation can only be deduced if the meanings of his words are re-interpreted. This extends the term of meaning, 'juxtaposed contexts', to the possibility that deception about one context is being enacted by another.

As the tale progresses, the notion of juxtaposed contexts is reinforced. Another description follows in which other role reversals are apparent, this time in relation to Red Riding Hood and Grandma:

> Now in a cottage on the edge of the forest there lived a little girl who went by the name of Red Riding Hood… The kid was not to be trusted an inch. She was a rattlesnake, a viper and an imperialist… Grandma was a louse too! (Phillips 230)

Tension is created by continuing discrepancies between stated and inferred versions of the tale. Other clues, such as inconsistencies of narrative voice and the fact that the narrator's scope is limited, reinforce these terms of meaning.

The first death — that of grandma — is used to define the conflicting relationship between inferred and explicit contexts. The reader learns that she dies, and through this recounting, it becomes clear that narrator is concealing information:

> When the wolf walked he liked to think things over... This took a lot of concentrating and when he was concentrating the wolf sometimes got lost in thought and didn't know what he was doing. Suddenly, and before he knew what was what, he found himself not only in Grandma's cottage but in her bedroom! He had kicked down the door. Grandma was pretty startled and demanded, 'What is the meaning of this?' 'I am repulsing an invasion,' the wolf explained, scorning all subterfuge. Grandma was an aggressor, that was clear. So the Wolf ate her up. (Phillips 231)

With the last six lines, it is revealed that the causal association in the narrator's explicit account is flawed. If the grandmother is 'an aggressor' it seems inconsistent that she also be represented as 'startled'. This instils doubt in the narrator's trustworthiness, and reinforces the possibility that he is lying. Even though the narrator explicitly associates himself with gentle qualities, the combined inferences indicate aggressive behaviour. As the story progresses to its resolution, it confirms that all explicit statements must be transformed onto these terms of dictator manipulation, in order to determine their meaning. Its series of deaths establishes the ontological parameters to be: viewing the world in multiple ways leads to comparing versions which provides an informed perspective and makes justice possible.

* * * * *

Through this analysis, the writer first articulated the way a story builds a specific ontological scope. The interaction between informational elements, as they progressively appear, build terms on which naming and assembly are conveyed. The next day, two of the computer scientists arrived with a way to represent this. It was the first moment one of the writer's ideas had found footing in their world.

The computer scientists had drawn concepts as nodes and links. The writer could do this too. She reinterpreted more of the 1927 version of the story using this method, and soon discovered it would be fairly easy to depict what she knew this way. The group's focus then shifted to the 1940 version, because it was harder.

Most of the information critical to the meaning of *Red Riding Hood as a Dictator Would Tell It* is not explicit. Instead the meanings depend on external contextual relations — a knowledge of dictators, of conventional tellings of Red Riding Hood, and even the fact that the story was written at a particular time. It also leverages multiple, changing meanings. When the writer tried to map this version, the next problem arose.

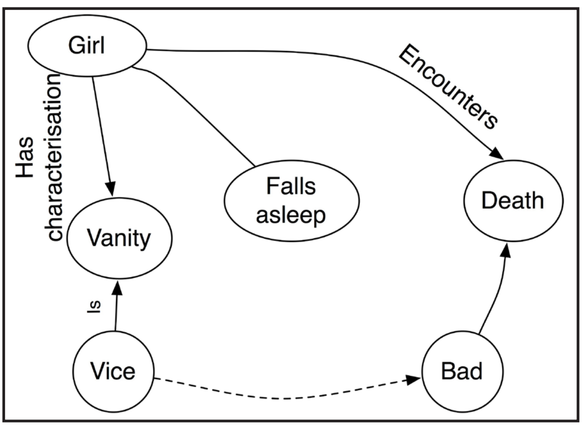

Fig. 2. Our team's first formal representation of story ontology

Too much was changing. She could not keep track of all the concepts. In order to record every semantic negotiation, she needed to leave enough drawing space on the page to include it. But there was so much renegotiation in this story that a new slice of paper was required for every sentence. With each step forward through the text, there was another fragment of information that did not fit, and she had to start drawing again. It was as though she had to know every structure that might surface in the story before commencing the representation. The urge to create a fixed ontology was creeping back into our modelling, along with the attendant problems.

The writer tried multiple sheets of paper, then experimented with sticking clear plastic film over existing diagrams. She considered constructing a three-dimensional installation artwork to capture this *Red Riding Hood's* ontology. Eventually the writer realised that her problem was, in fact, part of the model. It

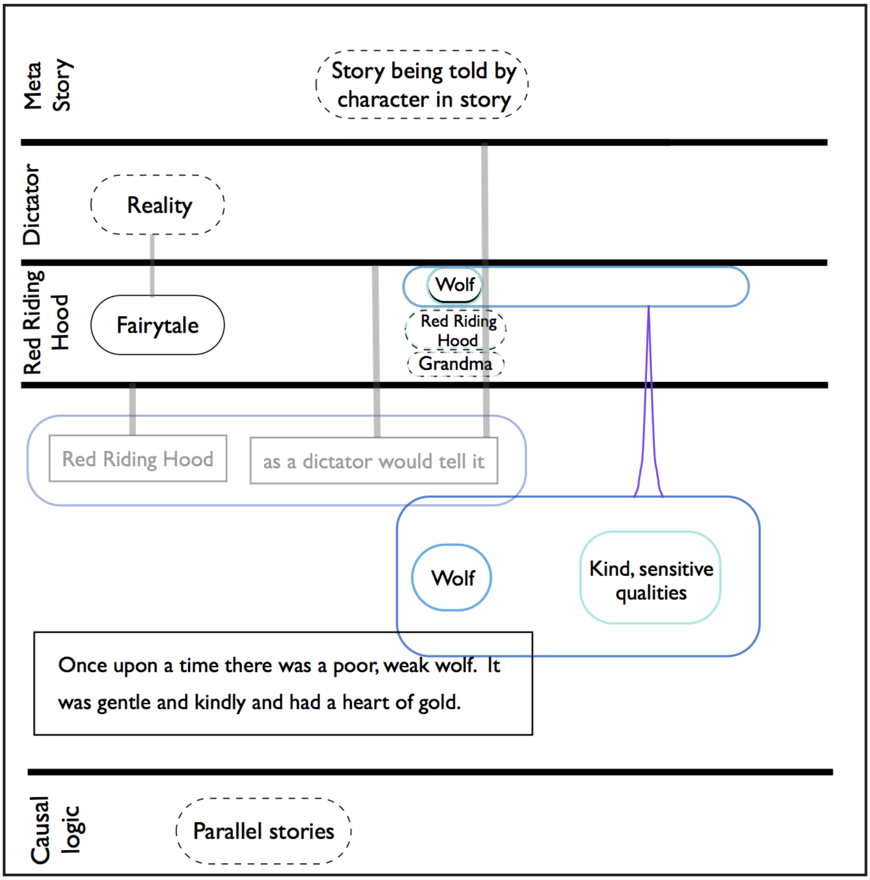

Fig. 3: Our animated ontology identifies a similarity between the terms in the story *Red Riding Hood as a Dictator Would Tell It* and those in the traditional fairy tale.

was not sufficient to make a system that anticipated every kind of structure that would appear — this was already understood. Our knowledge base would need ways to solve the problem the writer was drowning in. The ontology had to be able to move. There was another ontology behind it, related to assembly.

In fact, the writer didn't realise this until it coincided with a practical consideration. She was tired of redrawing the same picture on dozens of sheets of paper. She switched to the presentation program *Keynote* to save time. As *Keynote* provides progressive slides, it has a capacity for animation. Moving pictures offered an extra dimension of organisation — time. Because time-based unfolding was one of the issues at stake, this solved the initial problem the writer had been fighting.

Figures 3 and 4 show two consecutive slides from our approach to ontological representation. The 'bands' along the top are the inferred, reference contexts.

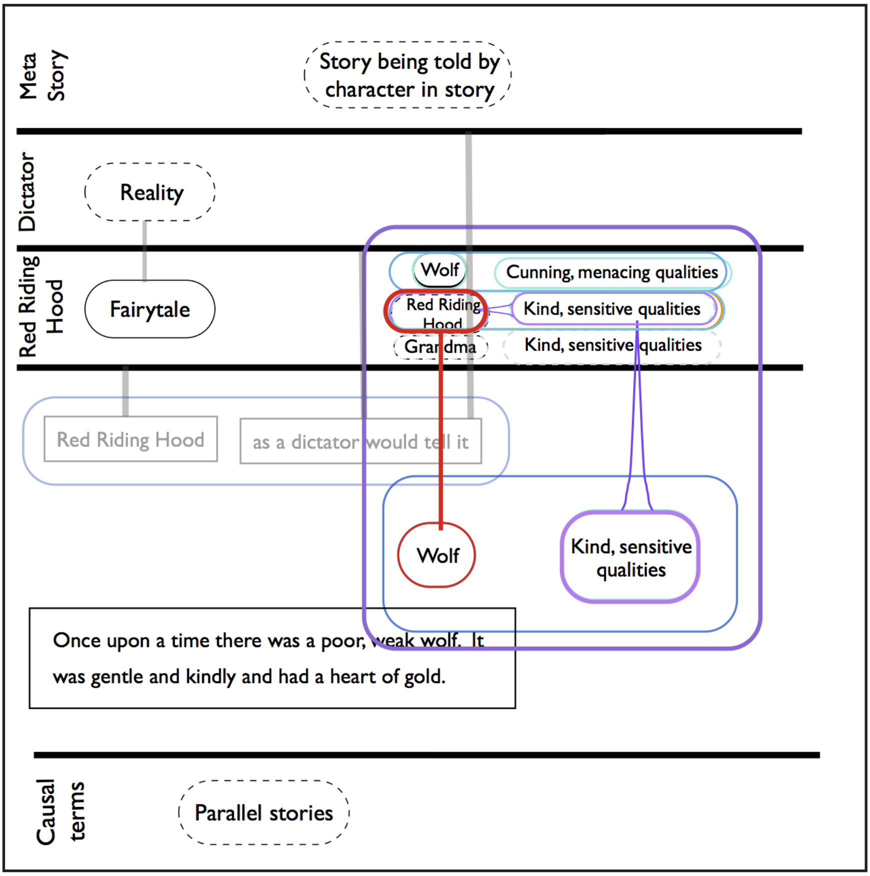

Fig. 4: A discrepancy is identified between some of the structures that have been matched in the example story and the fairy tale.

The band at the bottom is the space in which this particular story's ontology is assembled as the tale progresses. When text streams in, coloured boxes group concepts that are associated. Every time another part of the text appears, 'funnels' show how aspects of previous concepts are transferred. Finally, shapes that are coloured purple show when a conflict between concepts requires ontological rearrangement, in order to restore enough coherence to continue. All the links change over time, which can be represented as the slides progress.

We were ready to start collaborating on a system. The writer's keynote drawings provided a shared way to discuss it, one accessible to all of us. After four years of informal discussion and three years of funded collaboration, we were now at the point at which most system design begins, in which the programming team could design code to support it. But we were also far ahead of the beginning, having had an embodied experience of the process we wanted to model. The effort of making a ‘two-way conversation’ (Kapoor 642) had become such a significant part of our work that it provided the foundation for the product’s eventual shape.

* * * * *

What methodology can be used, in order to make a collaborative story, when different cultures are participating? Spivak suggests that an exchange of knowledges should start with an assumption of re-learning, and the attitude:

> I need to learn from you what you practice, I need it even if you didn’t want to share a bit of my pie; but there is something I want to give you, which will make our shared practice flourish. (Spivak 2000 16)

Instead of relying on established theories about the relationship between our domains, we depended on a strong engagement with each other, as well as a connection to a specific target context — the intended product. We wanted to design a knowledge base ontology that could cope with contextual transference and change. The principles that survived from each field were those that resonated in multiple spaces, including the reflective space, in which we understood the construction of our method in relation to the desired outcome. Ideas developed currency in relation to the confused looks on each other’s faces, and also in conjunction with the target product, only surviving if they were able to find new footing in both areas. We changed our words as we spoke, so that our languages grew towards each other, learning fresh affordances from the interaction. Through these incremental adjustments, new representations and contexts emerged from the desire to connect, and eventually cohered in unexpected ways. We discovered that building terms, and the stories that rest on them, is a dynamic process.

WORKS CITED

Beckett, Sandra L. 2002, *Recycling Red Riding Hood*, London, Routledge, New York.

Bettelheim, Bruno 1989, ‘Little Red Cap and the Pubertal Girl’, *Little Red Riding Hood: A Casebook*, ed. Alan Dundes, U of Wisconsin P, London, pp. 168–91.

Cardier, Beth 2004, ‘Symmetry in Fiction: Leaping Away from the Literal’, *Symmetry: Art and Science*, *Journal of ISIS-Symmetry*, 1–4, pp. 30–33.

Cheikes, Brant A. 2006, ‘Mitre Support to IKRIS — Final Report’, *Interoperable Knowledge Representation for Intelligence Support (IKRIS)*, ed. M. Corporation, The Northeast Regional Research Center, Northeast Regional Research Activity, online, http://nrrc.mitre.org/NRRC/Docs_Data/ikris/ICL_guide.pdf, accessed 20 February 2011.

Copeland, B. Jack. 1997, ‘CYC: A Case Study in Ontological Engineering’, *Electronic Journal of Analytic Philosophy*, ed. Istvan Berkeley, The University of Louisiana at Lafayette, 5, online, http://ejap.louisiana.edu/EJAP/1997.spring/copeland976.2.html, accessed 20 February 2011.

De la Mare, Walter 1993, ‘Little Red Riding Hood’, *The Trials and Tribulations of*

Little Red Riding Hood, Jack Zipes, Routledge, New York, pp. 208–214.

Devlin, Keith 1996, *Language at Work*, Center for the Study of Language and Information, Leyland Stanford Junior University, CSLI Publications.

Goranson, H.T. & Beth Cardier 2007, 'Scheherazade's Will — Quantum Narrative Agency', *Quantum Interaction*, ed. Peter Bruza, & William Lawless, Stanford UP, Menlo Park, Association for the Advancement of Artificial Intelligence, pp. 63–70.

Hendler, James 2001, 'Agents and the Semantic Web', *IEEE Intelligent Systems*, 16, pp. 30–37.

Hofweber, Thomas 2004, 'Stanford Encyclopedia of Philosophy', *Logic and Ontology*, ed. E.N. Zalta, Fall 2010, ed. Stanford, Metaphysics Reseach Lab, CSLI, Stanford University, online, http://plato.stanford.edu/archives/fall2010/entries/logic-ontology/, section 3.1, accessed 20 February 2011.

Ikris, C.W.G. 2005, 'ICL User's Guide', *Interoperable Knowledge Representation for Intelligence Support (IKRIS)*, ed. M. Corporation, The Northeast Regional Research Center, Northeast Regional Research Activity, online, http://nrrc.mitre.org/NRRC/Docs_Data/ikris/ICL_guide.pdf, accessed 20 February 2011.

Kanellopoulos, Dimitris 2008, 'An Ontology-Based System for Intelligent Matching of Travellers' Needs for Airline Seats', *International Journal of Computer Applications in Technology*, 32, pp. 194–205.

Kapoor, Ilan 2004, 'Hyper-Self-Reflexive Development? Spivak on Representing the Third World "Other"', *Third World Quarterly*, 25, pp. 627–47.

Law, John 2004, *After Method: Mess in Social Science Research*, Routledge, New York.

Orenstein, Catherine 2002, *Little Red Riding Hood Uncloaked*, Basic Books, New York.

Osgerby, Bill 1993, 'From the Roaring Twenties to the Swinging Sixties: Continuity and Change in British Youth Culture, 1929–59', *What Difference Did the War Make?*, ed. Brian Brivati, & Harriet Jones, Leicester UP, London, pp. 80–95.

Park, Jinsoo & Sudha Ram 2004, 'Information Systems Interoperability: What Lies Beneath?', *ACM Transactions on Information Systems*, 22, pp. 595–632.

Phillips, H.I. 1993, 'Little Red Riding Hood', *The Trials and Tribulations of Little Red Riding Hood*, ed. Jack Zipes, Routledge, New York, pp. 230–33.

Snow, C.P. 1993, *The Two Cultures*, Cambridge UP, London.

Spivak, Gayatri 2000, 'From Haverstock Hill Flat to US Classroom', *What's Left of Theory?*, ed. Judith Butler, John Guillory, & Kendall Thomas, Routledge, New York, pp. 1–39.

——— 1993, *Outside in the Teaching Machine*, Routledge, New York, London.

——— 1990, *The Post-Colonial Critic: Interviews, Strategies, Dialogues*, ed. Sarah Harasym, Routledge, New York.

Verran, H. 2002, 'Postcolonial Moment in Science Studies: Alternative Firing Regimes of Environmental Scientists and Aboriginal Landowners', *Social Studies of Science*, 32, pp. 729–62.

Ziolkowski, J.M. 2007, *Fairy Tales from before Fairy Tales: The Medieval Latin Past of Wonderful Lies*, U of Michigan P, Ann Arbor, Michigan.